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POTENTIALS OF THE BLUE NILE RIVER BASIN OF ETHIOPIA : ETHIOPIA GEODETIC PROJECT 1957 - 1961

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POTENTIALS OF THE BLUE NILE RIVER BASIN OF ETHIOPIA
ETHIOPIA GEODETIC PROJECT 1957-1961.

1. The magnificent resources of the Blue Nile River have long been recognized by the benignant rulers of the Abyssinian Highlands. For centuries they have studied the potentials of the river, but it was not until the reign of His Imperial Majesty, Haile Selassie I, Emperor of Ethiopia, that the development of the vast potentials for irrigation and power latent in the mountains and canyons of the watershed could be started. The watershed of the Blue Nile River includes over 300,000 square kilometers of west-central Ethiopia. The Blue Nile River has its source at Lake Tana in the Abyssinian Highlands at 1786 meters elevation above sea level. The river describes a semicircle on the high plateau and reaches the Ethiopia-Sudan border at 550 meters elevation and 850 kilometers from Lake Tana after passing through a gorge several hundred kilometers long, and at times approaching 30 kilometers in width and over a kilometer in depth. The gorge combined with the tributary gorges and mountainous character of the highlands provides unlimited numbers of sites for water resources developments.

2. The entire area is inhabited by agricultural people. The higher plateaus of the watershed are densely populated because of temperate climatic conditions and abundant precipitation. The extensive plains of the plateau and high valley provide thousands of square kilometers of rich soil. Important quantities of grains, hides, coffee, and other commodities are produced. Control of the abundant water supply for irrigation would increase agricultural production many fold and stimulate progress of the 5,000,000 farmers, herdsmen and artisians living in the watershed. The basic governmental and community structures exist to foster and promote physical development and to translate projects into personal income and public revenue. The development of the water resources of the Blue Nile River and tributaries in Ethiopia would provide power for industrial use and many essential factors in the continued growth and development of the country. Further, the use of the river waters for storage for power and irrigation in Ethiopia would not jeopardize other riparian countries.

INITIATION OF THE BASIN STUDY PROGRAM

3. The program initiated by the Imperial Ethiopian Government for the development of the Blue Nile River Basin was designed to provide an orderly and harmonious appraisal of resources to be followed by economically feasible physical developments. In 1956 Ethiopia concluded an Agreement with the United States for the study of the water resources of the area. In addition to a comprehensive water resources investigation and establishment of an Ethiopian Water Resources Department under the Imperial Ethiopian Ministry of Public Works, the program called for aerial photography and photomosaic maps plus precise geodetic control for use in the preparation of topographic maps. The agreement stipulated the contributions of both Governments, specifying technicians from the United States, and technicians, trainees and administrative personnel from Ethiopia. By a special agreement, the United States Coast and Geodetic Survey furnished 12 technicians to establish the precise geodetic control in the River Basin in accordance with approved geodetic standards and to provide on-the-job training in geodetic methods and procedures for Ethiopian nationals.

GEODETIC SURVEYS - PREREQUISITE TO RESOURCE APPRAISAL AND DEVELOPMENT

4. When Ethiopia initiated the Blue Nile River Basin program, basic geodetic control surveys and mapping were recognized as

required prerequisites of the water resources studies and subsequent physical development. Appraisals of resources cannot be rationally displayed and regional developments coordinated and economically pursued without basic surveys and maps. Accordingly, precise horizontal and vertical surveys were included. To be of maximum benefit, the surveys were required to be connected to the African Geodetic Datum and to mean-sea-level elevations to assure coordination of the program with present and future developments in adjacent areas and countries. The network of geodetic control in the basin was also designed to permit extension within the basin for large scale mapping for engineering works and throughout the remainder of Ethiopia.

5. An important feature of the geodetic program, significant to the aims of this conference, was the participation of Ethiopian technicians. A total of 60 employees of the Ministry of Public Works were assigned and after four years a nucleus of experienced Ethiopian geodetic surveyors remain capable of conducting precise surveys and capable of training other technicians in this important scientific field so essential to the development of Ethiopia and Africa.

CONDUCT OF GEODETIC SURVEYS IN ETHIOPIA

6. The geodetic control surveys in the Blue Nile River Basin were started in 1957 and continued without interruption until completion in 1961. A total of over 3,000 kilometers of arc triangulation and approximately the same length of spirit leveling was accomplished. The triangulation consisted of permanently marked stations spaced about 40 kilometers apart, supplemented by additional horizontal control stations for photogrammetry. The vertical control by spirit leveling established permanent bench marks at 3 to 5 kilometers spacing along the entire length of the leveling. All surveys were conducted using first-order methods and procedures. Taped and electronic base lines were used for distance control and astronomic latitudes, longitudes and azimuths for position control. With the cooperation of Sudan, connections were made to Sudanese surveys to provide horizontal positions on the African datum and vertical elevations related to mean-sea-level. A spur level line was also surveyed from the basin area eastward across Ethiopia to the Red Sea at Asseb completing a 4,000 kilometer leveling survey starting from the Mediterranean Sea at Alexandria, Egypt. The mean-sea-level of the Mediterranean Sea as carried by the surveys checked the mean-sea-level of the Red Sea by 0.18 meters.

STIMULUS OF TECHNOLOGY

7. Geodetic control surveys are frequently not awarded eminence commensurate with their importance to technological developments. Surveys are not an end product and are difficult to associate with the more evident and tangible phases of technological progress. However, control surveys must be used continuously from the first appraisal mapping for a development, through the planning and construction, and finally all during the span of its existence. In addition, basic geodetic control will decrease costs and expedite progress on contingent engineering and cadastral activity propagated by a resource development. The security of land tenure can be assured by land surveys tied to geodetic control. The mobilization of available internal potentials and the promotion of developed economy of an area is directly related to the status of the geodetic control and coordinated mapping in the area. The Ethiopian Geodetic Project of 1957 to 1961 contributed extensively to the development of the Blue Nile River Basin by establishing the surveys essential for the water resources inventory and appraisal. The control remains for further programs and concerted activity to increase the welfare of the area and the populace.

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